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This paper presents a brief overview of a study undertaken at the Center for Urban Studies of the University of Chicago for the Committee on Areas for Social and Economic Statistics of the Social Science Research Council, under a contract between the Council and the Bureau of the Census, U. S. Department of Commerce. The study's purposes were:

- -- "(to) conduct an examination of existing principles of area classification for Standard Metropolitan Statistical Areas, and an examination of alternative criteria, such as the concept of Functional Economic Areas, in order to formulate new principles of area classification."
- -- "(to) examine the effect of applying alternative criteria of integration of central cities and their outlying areas in the delineation of Standard Metropolitan Statistical Areas and their relationship to other classification systems."
- -- "(to) classify the entire United States into a hierarchy of urban, metropolitan and consolidated areas using criteria of size and of the linkages between places of work, places of residence, and places of shopping."

In the course of the investigation, five background papers, four large maps, a set of tables classifying the counties of the U.S. into functional economic areas, and a final report were issued. At the time this paper was being written, a few copies of the papers and reports were still obtainable from the Bureau of the Census. Copies of the maps are now being circulated for inspection by members of the audience. A final monograph will be published by the Bureau of the Census early in 1968. The tentative title is Metropolitan Area Definition: A Re-evaluation of Concept and Statistical Practice. Paralleling the contents of the monograph, in this paper I will first review briefly the history of statistical definition of metropolitan areas in the United States, the major types of criticisms of the criteria used to define Standard Metropolitan Statistical Areas in 1960, principal results of a study of the small-area journey-to-work data collected in the twenty-five per cent sample of 1960, and implications of these results for definition of statistical areas in the future.

History of Metropolitan Definition

Clearly, during the twentieth century both the scale and the pattern of the nation's urban growth have been transformed continuously and with increasing rapidity. These changes in the scale and pattern of American life were first recognized by the Bureau of the Census in 1910, when it introduced <u>Metropolitan Districts</u> to its system of area classification. This marked the first use by the Bureau of the Census of a unit other than the corporate boundaries of a city for reporting data on urban population. The Metropolitan District of 1910, defined for every city of over 200,000 inhabitants and reapplied with little alteration by the Bureau of the Census in 1920, 1930 and 1940, served basically to distinguish urban population, whether located within the central city or adjacent to it, from surrounding rural population. The idea behind the definition was in essence that stated in 1932:

". . . the population of the corporate city frequently gives a very inadequate idea of the population massed in and around that city, constituting the greater city, . . . and (the boundaries of) large cities in few cases . . . limit the urban population which that city represents or of which it is the center . . . If we are to have a correct picture of the massing or concentration of population in extensive urban areas . . . it is necessary to establish metropolitan districts which will show the magnitude of each of the principal population centers."

Almost as soon as the metropolitan concept was introduced to statistical practice, in the attempt to capture "the greater city," several factors led to dissatisfaction with the criteria and operational definitions used, or the results of their application, however. It is inevitable that any set of statistical areas transcending conventional legal jurisdictions will become the subject of local protest and political pressure. Almost any set of statistics will attract a coterie of users, too, and many of these users find weaknesses in the system for their particular purposes. Criteria used to operationalize something as fundamental and important as the metropolitan concept become the objects of academic evaluation and critique. And society itself continues to change, so even if criteria and areas may have been valid representations of conditions at a given period of time, they just as surely cease to be so in the course of time.

The resulting response has been one of successive modification of the definitional criteria. Metropolitan Districts were defined in 1940 for each incorporated city having 50,000 or more inhabitants, and included adjacent and contiguous minor civil divisions or incorporated places having a population density of 150 persons per square mile or more. In 1940, however, relatively few data were tabulated by minor civil divisions. At the same time, the various government agencies had no set of standardized regions for which they reported statistics. For example, Industrial Areas defined by the Census of Manufacturing, and Labor Market Areas used by the Bureau of Employment Security both differed from the Metropolitan Districts by which the Bureau of the Census reported data.

As a consequence, a further consideration

introduced in developing the Standard Metropolitan Areas of 1950 was "so that a wide variety of statistical data might be presented on a uniform basis." The S.M.A. consisted of one or more contiguous counties containing at least one city of 50,000 inhabitants. Additional counties had to meet certain criteria of metropolitan character and social and economic integration with the central city in order to be classified within an S.M.A. Various governmental agencies cooperated to collect and report data by this statistical unit. The S.M.A. was by its very nature a compromise, designed to facilitate uniform reporting of data. It differed from the old Metropolitan District in that it was not defined primarily upon density criteria. The introduction of the Urbanized Area in 1950 provided a unit that fit more closely to the idea of the Metropolitan District.

The <u>Standard Metropolitan Statistical Area</u> of 1960 represents a slight revision of the S.M. A. concept, the word "statistical" being added so that the character of the area being defined might be better understood.

The primary objective of the S.M.S.A. has been stated to be to facilitate the utilization by all Federal statistical agencies of a uniform area for which to publish statistical data useful in analyzing metropolitan problems. The usefulness of the data has been related most especially to the fact that S.M.S.As. take into account places of industrial concentration (labor demand) and of population concentration (labor supply).

Two main claims have been advanced for the S.M.S.A. First, it provides a 'standard' area composed of a large city and its closely integrated surrounding area which can be used by the Bureau of the Census and other government agencies for purposes of data gathering, analysis and presentation. Secondly, the classification provides a distinction between metropolitan and non-metropolitan areas by type of residence, replacing the older rural-urban, farm-non-farm distinctions.

The S.M.S.A. has been used extensively as a reporting unit by many government agencies for publication of statistics. Statistical users outside the federal establishment have included local planning agencies, sales and advertising concerns, while much non-statistical use has been made of the classification by local boosters and political organizations in individual communities. Many of the non-Federal users of the S.M.S.A. data assume that the areas defined as metropolitan represent, in some measure, trading areas for the metropolis. Thus, use of S.M.S.A. data to establish quantitative indices of potential sales market areas, to set comparative guidelines for contrasting markets and market penetration, and to allocate man-power for sales and promotion efforts is common. Local and regional planners find S.M.S.A. data useful especially because of the quantity of information provided that would be unavailable to them otherwise, and because the areas are ready-made planning regions within which they can study broad trends of change relating to mobility, social and economic patterns of the population, and land use consumption. Recently, as an outcome

of the Demonstration Cities and Metropolitan Development Act of 1966, many kinds of requests for federal public works monies must first be submitted to regional metropolitan planning agencies designated by the federal government. The Department of Housing and Urban Development has been given the responsibility for selecting the appropriate planning agencies, covering the relevant S.M.S.A., so the statistical units now have an increasing institutional superstructure.

Criticisms of the 1960 S.M.S.A.

At the very time that new legal status has been given to the current set of statistical areas, a wide and substantial volume of criticism is evident, however. The criteria used in 1960 sought to operationalize, in the words of the Bureau of the Budget, a "general conc t of a metropolitan area . . . one of an integrated economic and social unit with a recognized large population nucleus." Population criteria (a central city of at least 50,000 people, or qualifying "twin" cities) were used to identify a set of nuclei, for each of which an S.M.S.A. would be created. Criteria of integration then revealed the outlying counties that had qualifying levels of integration with the nucleus (15 per cent of the outlying county's workers are employed in the central county, or 25 per cent of the workers in the outlying county live in the central county). Finally, criteria of metropolitan character eliminated those otherwise integrated counties that did not have 75 per cent of their labor force engaged in non-agricultural activities and failed to meet at least one of three additional considerations:

- a) "It must have 50% or more of its population living in contiguous minor civil divisions with a density of at least 150 persons per square mile, in an unbroken chain of minor civil divisions with such a density radiating from a central city in the area."
- b) "The number of nonagricultural workers employed in the county must equal at least 10% of the number of nonagricultural workers employed in the county containing the largest city in the area, or be the place of employment of 10,000 non-agricultural workers."
- c) "The non-agricultural labor force living in the county must equal at least 10% of the number of the nonagricultural labor force living in the county containing the largest city in the area, or be the place of residence of a non-agricultural labor force of 10,000."

Each of the criteria used to define the S.M.S.A. has been subject to criticism from many points of view, viz:

Population Criteria

Questions have been raised concerning the basis on which the population criteria should be defined, concerning the necessity of a minimum and/or a maximum limit to population, and regarding the county and distance measures established in Criterion 2 for combining adjacent counties, each containing central cities, into a single S.M.S.A. On a more basic level, there is disagreement concerning the relation of population thresholds and economic organization.

Some authors have argued that the urbanized area should be used as the population base instead of the central city. The number 50,000 itself has been challenged on several scores. To some, that number seems too arbitrary and too large since a great many of the smaller centers of local activity in rural areas will be missed, thus over-emphasizing the importance of size in economic organization of space. Others feel that a city of 50,000 is really too small to constitute a metropolitan center, and that larger areas exceeding 250,000 people are most meaningful in an economic context today.

Criteria of Metropolitan Character

The criteria of metropolitan character have been subjected to heavy criticism and question. The criticisms arise, for the most part, from the vague and uncertain understanding of the meaning of this concept. No full or adequate apologia has been enunciated, and the social and economic connotations of the criteria have been subject to much debate. The evident compromise nature of the present definition has contributed considerably to the confusion.

At the most explicit level, questions about the selection of all particular thresholds have been raised. How does one justify a requirement that 50% of the population live in contiguous minor civil divisions with a certain minimum density? Further, how does one define the non-agricultural labor force? Where do parttime farmers fit in? Specific objections have been raised to the unique definition of the New England S.M.S.A.

In reviewing the comments addressed to it, the Bureau of the Budget has found numerous inconsistencies of application and a bewildering variety of choices made possible because of nonconformance to a few criteria by many counties. For example, the Bureau of the Budget found 38 areas in which counties otherwise qualifying as metropolitan have been excluded because of low total population, low total labor force, or insufficiently high population density.

General uncertainties of meaning are accompanied first, by specific questions about the apparent conflicts arising from defining metropolitan character in both economic and social terms. Second, issues of the urban-rural distinction, a distinction long indistinct, still appear to be built into the metropolitan character criteria in the language of density and size introduced by Wirth. Third, the definition ignores, except in the crudest sense, the question of the necessity for some landscape criteria by which to enunciate metropolitan character. The literature on metropolitan areas reveals a basic cleavage between scholars relying on some landscape element to form part of their definition and another group who find it unnecessary to include any specific reference to particular landscape features when discussing the concept.

Definition of the S.M.S.A. with reference both to social and economic criteria has created differing interpretations. It has been implied by some that the county was both a place of work and a home for concentrations of non-agricultural workers while, at the same time, functioning as the primary trading area for the metropolis. Are either or both of these conditions necessary for a county to be metropolitan in an economic sense? Some evidence suggests that wholesale trading territories for large metropolitan areas are coterminous with farm to city migration areas, suggesting a correspondence of boundaries of several indicators of metropolitan economic influence, and that retail trade areas are coincident with commuting areas for smaller places. In agricultural areas and around smaller S.M.S.A. central cities, these findings notwithstanding, others have argued that the general trade area of the central city covers a more extensive terrain than does any kind of extended migration or commutation zone. Further knowledge about commuting patterns will elucidate the unknowns here. It is likely, however, that the patterns will vary for metropolitan areas of different sizes and in different parts of the country. If one refers to a "metropolitan economy," then it is clear that the larger S.M.S.A.'s are underbounded. If one refers to activity patterns of individuals and groups living within metropolitan areas, then it is clear from research that there is little difference between groups included within metropolitan areas and some of those which are excluded. The differences appear to be more distinct between workers engaged in urban pursuits and those engaged in rural agricultural pursuits. If by metropolitan character of an area we mean the use of that land by various groups, then it is clear that the sphere of influence of metropolitan dwellers extends far beyond the counties currently classified as metropolitan. At this point the discussion reverts to the problem of interpreting what is meant by "metropolitan".

Criteria of Integration

The main thrust of criticism of the criteria of integration is to demand that a more precise and detailed statement about economic and social integration within the metropolitan area be made.

The percentage figures established by the Bureau of the Budget have been questioned. The necessity for direct contact with the central county has been questioned by pointing to the lack of unified labor markets within large metropolitan areas. The achievement of maximum accessibility throughout the metropolitan area with reductions in the cost and time required for travel has led to the suggestion that a commuting radius be established on the basis of time taken to reach the central county or its central area.

The whole question of integration without what is commonly thought to be metropolitan character is implicit in several of the classification schemes. The classifications suggested by both Friedmann and Miller, and by Fox revolve around a notion of integration without the accompanying population density criterion now closely associated with metropolitan character. These schemes propose a radical alternative to our present definition of the metropolitan concept. Friedmann and Miller see a changing scale in urban life accompanying technological and economic developments. Such an idea rejects as no longer useful the classification distinguishing metropolitan from non-metropolitan, and it suggests that a new and broad urban realm is significant. The argument rests largely on the claim that the area in which a metropolitan population lives and conducts its social activities now encompasses a broad zone around metropolitan centers. This zone, or realm, extends, perhaps, to about 100 miles from the central city, and is defined as the limits for regular week-end or seasonal use. Within this area, the imprint of the urban dweller is of paramount significance. This realm is largely coincident with areas of general economic health as well, they maintain. Fox is concerned with small, functionally

Fox is concerned with small, functionally specialized regions which he considers to be the major facts of economic importance in the regionalization of most of the country. Integration here is often without metropolitan character since many of the smaller centers are too tiny to be classed as metropolitan under present schemes or because population densities may be low. Nevertheless, Fox posits such a system of <u>functional economic areas</u> as the economic building blocks for a regionalization of the United States.

The Journey-to-Work Evidence of 1960

Analysis of the small area commuting data collected as part of the 1960 census shows that a set of urban realms in fact constitutes the nation's functional economic areas. This finding leads to proposals for a revised area classification that lends itself to a range of practical applications within the framework of emerging national urban policy.

In 1960, you will recall that for the first time, the Census of Population and Housing included a question to determine the commuting behavior of the population of the United States. Item P 28 of the Household Questionnaire read:

P28. What city and county did he work in last week?

Individual and household data were assembled into totals for each of the country's 43,000 Standard Location Areas. For each S.L.A. it was then decided what initially appeared to be the thirteen most important workplace locations for residents from among a set of 4,300 possible workplaces. Theoretically, then, the 1960 journey-to-work data were assembled into a 43,000 by 4,300 matrix of from-to journey-towork information; however, the SLAs were in fact grouped into some 4,300 sub-matrices, each of which had only 13 columns and two balance categories.

Commuting Fields and Labor Markets

For any workplace, a reporting booklet could be prepared listing all SLAs sending commuters to it, and for each of the SLAs showing how many and what proportion of the resident workers travelled to each of its thirteen workplace alternatives or fell in one or the other of the balance categories. With such information in hand it was possible to plot a map for each workplace and surrounding territory, showing the percentage of the workers resident in each S.L.A. commuting to the workplace. Because of the regular decline of the commuting rate with distance, it was also possible to contour the percentages to depict the <u>commuting</u> <u>field</u> of that workplace. The outer limit of this field is described by a zero contour beyond which there is no reported inward commuting; this is the area within which jobs and homes are brought into balance--the area which serves as a bounded "container" for the journey-to-work.

Commuting fields were mapped for every S.M. S.A. central city, for most urban centers in the 25,000-50,000 population range, and many small places. The complete set of commuting fields is depicted on the map <u>Commuting Fields of Central</u> <u>Cities</u>, which has been circulated to the audience.

An immediate contrast may be drawn between the map of the country's Standard Metropolitan Statistical Areas, as defined by the Bureau of the Budget, and the map showing areas within the commuting fields of cities in 1960. Whereas two-thirds of the nation's population resided in the 1960 S.M.S.As., in fact 87 per cent lived within the commuting area of one of the 1960 S.M.S.A's. central cities (many within more than one such area). Another 9 per cent lived in the commuting fields of somewhat smaller centers that filled the populated gaps between metropolitan labor markets.

In fact, then, in 1960 the populated parts of the nation were completely metropolitanized -- covered by a network of urban fields. They were also patterned socially and economically by them. Each of the commuting fields shows a very fundamental property of the country's residential areas: degree of participation in metropolitan labor markets. As degree of metropolitan labor market participation declines with increasing distance from the city, population densities and proportion of the population classified as urban decline, together with average value of farmland and buildings, median family income, median school years completed, rate of population increase (which becomes negative in the peripheries) and per cent gain in the population through migration (which also becomes negative). On the other hand, percentage of the population classified as rural nonfarm rises and then falls, and both the percentage of families with incomes less than \$3,000.00 and the unemployment rate increase.

The changes are like a musical score; they are rhythmic, rising and falling in concert. Population response is revealed by relative rates of change at the center and decline at the periphery.

Only urban centers with populations exceeding 25,000 appear to have much peaking effect on the gradients. For larger sizes of central city the "peaks" rise with rank in the urban hierarchy, up to the level of the nation's largest metropoli. But in the latter there is an involution, with gradients dropping in the inner-city ghettos. Also, where labor markets overlap, and substantial cross-commuting results from alternative employment opportunities, regional welfare levels are maintained at high levels at the outer edges of the commuting fields. The journey-to-work data thus indicate patterns of labor market participation in metropolitan commuting fields that are very profound indexes of socio-economic rhythms present in the characteristics of the population of the United States.

Several other things are apparent in the maps of commuting fields and the related socioeconomic gradients:

(1) Clearly, the areas socially and economically integrated with given central cities are far more extensive than the 1960 S.M.S.A.s. This should be no surprise, given use of the 15 per cent commuting criterion plus the criteria of metropolitan character to reduce and constrain their boundaries. However, if the commuting patterns and resulting variations in degree of metropolitan labor market participation and related socio-economic gradients are to be considered seriously, these constraints cut accross continous, correlated patterns rather than seeking out real limits such as discontinuities or major transitional zones. In fact, the only such limit evident in the data is where one commuting field leaves off and the socio-economic characteristics begin to respond to the pulls of another central city.

(2) Similarly, in the least densely-populated parts of the nation's settled area, commuting fields focus on urban centers of less than 50,000 population, although sizes must in general exceed 25,000 to have any effects on the socio-economic gradients flowing outwards from larger places.

(3) At the other extreme, particularly in the manufacturing belt, labor markets overlap in elaborate ways. The urban regions of "megalopolis" are highly complex, multi-centered entities.

At least three questions of definitional practice are raised in view of these considerations:

(1) If the intent is to define "economically and socially integrated units with a recognized large population nucleus," are the limiting constraints of the criteria of metropolitan character and the 15 per cent commuting criterion desirable and reasonable? In light of the evidence, we think not.

(2) What is an appropriate size limit for the central city of the statistical area, and indeed, is the size of the central city a valid population criterion? Although one may want to start with the 50,000 size for historical reasons, the total population of the entire region is probably more interesting.

(3) How is the complexity of the most densely-populated parts of the country to be handled? Clearly, no units focusing on single centers will be able to embrace the interdependent labor markets. Is a multi-centered urban region an appropriate substitute? We think so, and suggest a comprehensive set of Consolidated Urban Regions.

The steps taken in 1960 clearly overcame these issues by beginning with a prior definition of a set of centers, for each of which a metropolitan area was to be built of county building-blocks. The commuting criterion then pointed out counties potentially eligible for membership in each of the S.M.S.A., and the criterion of metropolitan character led to elimination of some of the potential candidates. Lipservice was given to interdependencies by creation of the New York and Chicago Consolidated Regions. The whole procedure was simple, straightforward, and easy to apply.

<u>Functional Economic Areas</u> and Consolidated Urban Regions

Are there equally simple alternates that start with the same population criterion, rely on county building-blocks (one of the features of the journey-to-work small area data is that county units may be retained without undue loss of detail) in the same way, but come closer to real areas of daily journey-to-work interdependence?

Proposed Definitions

Considerable experimentation with the journey-to-work data led to the following set of definitions, which goes a long way to providing a viable series of alternates:

1. COMMUTING FIELD

An area encompassing all standard location areas sending commuters to a designated workplace area. The field varies in intensity according to the proportion of resident employees in each SLA commuting to the workplace, and may be depicted cartographically by contours that enclose all areas exceeding a state degree of commuting. Note: There will be as many commuting fields as there are designated workplace areas.

2. LABOR MARKET

All counties sending commuters to a given central county.

2a. CENTRAL COUNTY

The designated workplace area for definition of a labor market.

2b. CENTRAL CITY

The principal city located in a central county. Note: S.M.S.A. criteria 1 and 2 might be carried through to further specify 2a and 2b.

3. FUNCTIONAL ECONOMIC AREA (F.E.A)

All those counties within a labor market for which the proportion of resident workers commuting to a given central county exceeds the proportion commuting to alternative central counties. Note: There will be as many F.E.A.'s as there are central counties.

4. CONSOLIDATED URBAN REGION (C.U.R.)

Two or more F.E.A.'s for which at least five per cent of the resident workers of the central county of one commute to the central county of another. Note: No prior determination of the number of C.U.R.'s is possible, but application of the criterion to the 1960 data produced 31.

Results of applying these criteria are shown in the maps <u>Functional Economic Areas of the Uni-</u> ted States and <u>Consolidated Urban Regions</u>.

The regionalization used to create the 1960 S.M.S.A.'s and the functional regionalization evidenced by commuting behavior are significantly different. A major choice must be made by the U. S. Bureaus of the Budget and Census, for the 1960 classification does not produce fully-integrated areas with a large population nucleus even though this was the underlying concept. Is the intention to classify areas on the basis of how they look? In this case, continuation of present practice will suffice, and attention should be focused on the criteria of metropolitan character (although continuation of the practice of defining urbanized areas may be a more appropriate substitute). Alternatively, should the areas embrace people with common patterns of behavior? Then, commuting data dealing with daily behavior and the links between place of residence and place of work are relevant.

Comparability is <u>not</u> the issue if county building-blocks are used. Besides, there has been little consistency in definitional practice since inception of attempts to define metropolitan areas. Nor should consistency be expected in a dynamic socio-economy in which patterns of organization and behavior are subject to continuing change.

There is a hard problem of choice, since there is general agreement that some form of area classification will be required for publication of summary statistics for some time to come.

We recommend the following:

- 1. County building-blocks or equivalent units be retained as the basis of any area classification, in all parts of the country.
- 2. County-to-county commuting data be the basis of the classification of counties into functional economic areas.
- 3. Functional Economic Areas be delineated around all central counties satisfying the existing S.M.S.A. criteria 1 and 2, and in addition be created for smaller regional centers in the less densely-populated parts of the country.
- 4. Where significant cross-commuting takes place, functional economic areas be merged by the creation of a consistent set of Consolidated Urban Regions.
- 5. Consideration be given, for neatness of social accounting, to allocating all unallocated counties to one of the F.E.A.'s or C.U.R.'s on the basis of additional criteria of regional interdependence.